

### **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 41 to 67 and 76 to 78 are under active examination.

Examiner has rejected claims 41-58, 60-67, 76 and 77 as being unpatentable over Harris et al. (WO 00/57022) in view of Still et al. (US 7,166,560).

Examiner acknowledged that Harris et al. fails to teach a process wherein a solid polymer capable of being converted by hydrolysis into one or more organic acids is dispersed in a treatment fluid, as required by independent claim 41. However, Examiner argued that it would be obvious to one having ordinary skill in the art to substitute the ester used in Harris et al. by a solid polymer as taught by Still et al. For the reasons set out in detail below, Applicant maintains that this step would not have been obvious to one of ordinary skill in the art.

#### **Claims 41-48, 50-58, 60-67 and 77**

##### **1. One of ordinary skill in the art would not contemplate combining these documents**

As argued in the Amendment dated July 2, 2010 filed in response to the previous Office Action, Applicant maintains that one of ordinary skill in the art would not consider modifying the invention of Harris et al. based on the teaching in Still et al.

As noted previously, both Harris et al. and the present invention are concerned with processes for the removal of filter cakes from underground formations. As one of ordinary skill in the art would be aware, in such a process it is important that premature fluid loss is avoided. Premature fluid loss can, for example, adversely affect placement of the treatment fluid, leading to lost circulation and/or failure of a gravel pack. It is evident from both Harris et al. and the present specification that this is an important consideration when designing procedures for disrupting filter cakes (see, for example, Harris et al. page 4 lines 7 to 20 and present specification page 3 line 25 to page 4 line 2 and page 16 lines 3 to 20).

In contrast, Still et al. deals with acid fracturing methods. As noted previously, the aim of an acid fracturing treatment is to use acid delivered at high pressure in order to etch the faces of a rock fracture, so that when the pressure is released and the fracture closes, the etched fracture faces retain highly permeable channels that remain open and enhance the flow rate.

One of ordinary skill in the art *would* therefore understand that the techniques described in Harris et al. and Still et al. are completely different. In particular, both the purpose of the

techniques and the environmental conditions used to effect them are different. It is important to recognize that the Still et al. procedure is fundamentally unsuitable for carrying out filter cake disruption: if the Still et al. treatment fluid were to be delivered under the high pressure conditions of Still into a well bore containing a filter cake, then massive premature fluid loss would result. This is because the high pressure used in acid fracturing procedures would lead to fracturing of the formation containing the filter cake. As noted above, such massive premature fluid loss is precisely the eventuality that the invention of Harris et al and the present invention seek to avoid. Consequently, one of ordinary skill in the art, seeking to invent a filter cake disruption procedure, would not contemplate looking for guidance in documents, such as Still et al., that relate exclusively to acid fracturing.

Furthermore, even if one of ordinary skill in the art were to read Still et al., he or she would also recognize that the behavior of a particular treatment fluid under acid fracturing conditions cannot realistically be equated with the expected behavior of the same fluid under filter cake disruption conditions. One of ordinary skill in the art, seeking to provide a filter cake disruption process, would not be interested in the alleged deficiencies or benefits of a particular treatment fluid component when applied to an acid fracturing procedure because the pertaining environmental conditions are too different to make such a comparison meaningful.

Accordingly, it would not be obvious to combine Harris et al. and Still et al.

It is noted that, in the Office Action, Examiner argued that Harris et al. and Still et al. are not incompatible on the basis that both documents teach that “material capable of being converted by hydrolysis into one or more organic acids” can be used to generate acid at a filter cake and/or at surrounding carbonate rock. However, in response Applicant wishes to point out that Harris et al. and Still et al. teach that different materials (liquid ester or solid polymer) generate acid at a particular location under different conditions (filter cake disruption conditions or acid fracturing conditions, respectively).

Still et al. does assert that, under acid fracturing conditions carried out under high pressure, a solid polymer may self-destruct in “*part of a suspension in a treatment fluid in the wellbore, in the perforations, in a fracture, as a component of a filter cake on the walls of a wellbore or of a fracture, or in the pores of the formation itself*” (column 6 lines 61 to 67). However, it does not follow from this assertion, even if correct, that a solid polymer would be

expected to behave in the same or in a similar way under the completely different conditions applicable to filter cake disruption procedures. Rather, as noted above, the significantly different aims and conditions applicable to filter cake disruption procedures mean that one of ordinary skill in the art would not contemplate combining Harris et al. with Still et al., regardless of what Still et al. asserts may occur to a solid polymer when injected under high pressure in an acid fracturing treatment.

2. Even if one of ordinary skill in the art had given further contemplation to the teaching of Still et al., it would still not have been obvious to replace the liquid ester of Harris et al. with the solid polymer of Still et al.

For the reasons explained above, Applicant maintains that when a realistic overview is taken of the contrasting techniques of Harris et al. and Still et al., one of ordinary skill in the art would not have given serious contemplation to making the combination proposed by Examiner. A determination of *prima facie* obviousness requires a reasonable expectation of success. *See In re Rinehart*, 189 USPQ 143, 148 (CCPA 1976) which is not present in the current fact situation.

Nonetheless, even if such contemplation had been given, it remains to be considered whether there would be sufficient motivation for one of ordinary skill in the art to replace the liquid ester of Harris et. with the solid polymer of Still et al. Applicant maintains that there is no such motivation.

*a. No motivation to use a solid polymer on the basis that liquid esters “hydrolyze too slowly”*

In the Office Action, Examiner argued that Still et al. teaches that when liquid esters are used to form acid down hole then the acid forms very rapidly, whereas solid polymer allows for more controlled release of acid *in situ*, thereby motivating one of ordinary skill in the art to replace the liquid ester of Harris et al. with a solid polymer. However, Applicant respectfully disagrees with that reasoning. In that regard, it is important to recognize that the discussion in Still et al. and referred to by Examiner is concerned with the effectiveness or otherwise of materials for producing acid in an acid fracturing process, not in a filter cake disruption process. One of ordinary skill in the art would not be concerned with whether liquid ester allegedly hydrolyzes too fast when applied in an acid fracturing process (which is necessarily carried out at high pressure, and typically also at high temperature). Rather, he or she is interested in whether liquid ester is suitable for filter cake disruption. Indeed, it can be noted that the clear implication

of Still et al. is that the very reason that liquid ester is not suitable for acid fracturing is that it tends successfully to disrupt a filter cake rather than reaching the parts of the wellbore where fracturing is desired (see for example column 1 lines 49 to 62 of Still et al.).

Moreover, one of ordinary skill in the art would be well aware (not least from Harris et al. itself) that liquid esters are suitable for filter cake disruption. Contrary to Examiner's line of reasoning, there was no recognition in the art at the time of the present invention that a liquid ester hydrolyzed too fast to be suitable for filter cake disruption. Harris et al. for example teaches at page 6, line 28 to page 7, line 12 that liquid esters hydrolyze slowly at low temperatures (for example even taking several weeks to hydrolyze), indicating that under some circumstances this slow rate may be acceptable while under other circumstances additional materials may be added to *speed up* hydrolysis. Similar teachings can be found in US 5,678,632, which teaches that an enzyme can be added to speed up liquid ester hydrolysis, and US 6,702,023, which teaches the use of another catalyst to speed up hydrolysis. (Both of these documents stand in the name of the present Applicant and have previously been made of record for this application.)

A still further example of this understanding in the art, that liquid esters do not generally have an undesirably slow hydrolysis rate, can be seen in US 7,431,088B (Moorehead). This document teaches (see, for example, claim 4) that liquid esters can have a half-life in the range of from 6 to about 16 hours when hydrolyzed with water at 100 °C.

Accordingly, one of ordinary skill in the art would not have considered that liquid esters have too rapid a hydrolysis rate when used in a filter cake disruption process. The references to hydrolysis rate in Still et al. relate to acid fracturing conditions, which as noted above are particularly extreme (e.g., they are carried out under high pressure) and are therefore not relevant to the Harris et al. teaching or the present invention. Thus, there remains no motivation in the prior art to consider replacing the liquid ester of Harris et al. with a material having a slower hydrolysis rate.

Applicant also notes in passing that US 7,431,088B, which was filed after the present application, has now been granted. This patent claims a method of acidizing in a well in which an ester of a hydroxy acid is used to remove filter cake. The case was allowed notwithstanding

that the presently-cited Still et al., which was also cited during prosecution of US 7,431,088B, refers to use of lactide in acid fracturing techniques.

*b. No motivation to apply the Still et al. materials to a treatment fluid designed for disruption of a filter cake already present in an underground formation*

Applicant notes that the passage in Still et al. at column 6 lines 61 to 67, which was referred to by Examiner as teaching that solid polymer is capable of hydrolyzing at the location of a filter cake, specifically discloses that

*“The solid acid-precursor particles ... self-destruct ... in the location where they are placed ... That location may be ... as a component of a filter cake ...”* (emphasis added).

Thus, Still et al. at most teaches that, under acid fracturing conditions, the particles of a solid polymer may self-destruct when they have been introduced as a component of a filter cake. In other words, they may undergo an internal filter-cake breaking process under such conditions (albeit that the purpose of Still et al. remains being to deliver at least “the great majority” of the particles to a fracture to etch the fracture faces - column 7, lines 5 to 7).

Still et al. does not disclose or suggest delivery of solid polymer into an underground formation that already contains a filter cake, whereupon the solid polymer hydrolyzes and disrupts that pre-existing filter cake. Accordingly, there is no motivation for one of ordinary skill in the art, seeking to provide a process for disrupting such a pre-existing filter cake, to replace the liquid ester of Harris et al. with a solid polymer of Still et al.

*c. Results of replacing the liquid ester of Harris et al. by the solid polymer of Still et al. not predictable*

It is also not evident from the prior art what would be the results of combining the elements of Harris et al and Still et al. in the manner proposed by Examiner. As noted above, Still et al. does not provide any indication as to the likely behavior of the solid polymers taught in that document should they be used not in an acid fracturing procedure, but in a filter cake disruption process. Harris et al. is also entirely silent on the use of solid polymers or their suitability for filter cake disruption. It therefore is not reasonable to presume that solid polymer could have replaced liquid ester in a process otherwise as taught by Harris to result in a process suitable for exogenously disrupting a filter cake.

For all of these reasons, it is submitted that independent claim 41 is non-obvious over Harris et al. in view of Still et al. It therefore necessarily follows that dependent claims 42-48, 50-58, 60-67 and 77 are patentable for the same reasons.

**Claims 49 and 76**

Dependent claims 49 and 76 are patentable in view of the patentability of independent claim 41. However, Applicant wishes also to point out that claims 49 and 76 require encapsulation, dissolution or dispersion in the solid polymer of materials, chemicals, catalysts or enzymes that have functional activity for filter cake treatment or as production chemicals.

In the Office Action and in relation to these claims, Examiner referred to column 5 line 53 to column 7 line 7 of Still et al. However, this passage of Still et al. refers to the use of combined particles of solid polymer and "solid acid-reactive materials". There is no disclosure or suggestion in Still of incorporation of any chemical that has a functional functional activity for filter cake treatment or as production chemicals. Consequently, this provides a further reason why claims 49 and 76 are not obvious from Harris et al. in view of Still et al.

Favorable reconsideration and withdrawal of the outstanding objections and rejections is believed to be in order and is respectfully requested.

All outstanding issues have been addressed and this application is in condition for allowance. Should any minor issues remain outstanding, the Examiner should contact the undersigned at the telephone number listed below so they can be resolved expeditiously without need of a further written action.

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 14-1140.

HARRIS et al.  
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Respectfully submitted,

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